Perioperative Interscalene Block Versus Intra-Articular Injection of Local Anesthetics for Postoperative Analgesia in Shoulder Surgery

Véronique Beaudet, M.D., Stephan R. Williams, M.D., Ph.D., Patrice Tétreault, M.D., F.R.C.S.C., and Michel-Antoine Perrault, M.D., F.R.C.P.C.

Background and Objectives: Up to 70% of patients report moderate to severe pain after shoulder surgery, which can compromise early rehabilitation and functional recuperation. Postoperative shoulder pain control is improved with both interscalene block and intra-articular local anesthetic injection. The present study hypothesized that perioperative interscalene analgesia would offer pain control superior to perioperative intra-articular local anesthetics over the first 24 hours after surgery.

Methods: Sixty patients undergoing shoulder surgery were randomly assigned to 1 of 2 groups: group IS had interscalene block with catheter installation, while group IA received intra-articular local anesthetic, also with catheter installation. All patients received 3 local anesthetic injections: 0.25 mL/kg of 2% lidocaine with epinephrine 2.5 μg/mL immediately before and after surgery, and 0.25 mL/kg of 0.5% bupivacaine with epinephrine 2.5 μg/mL 1 hour after the end of surgery, after which the catheters were removed, and no further local anesthetics were administered. Postoperative pain at rest was evaluated in the postanesthesia care unit (PACU), 3 hours, 6 hours and 24 hours after surgery. The area under the 24 hour pain over time curve was calculated. Hydromorphone consumption in the PACU and over 24 hours was recorded.

Results: Pain scores (IS: 0.4 $\pm$ 2 vs. IA: 4 $\pm$ 3, $P < .0001$) and opioid consumption (IS: 0.7 mg $\pm$ 1.4 vs. IA: 1.5 mg $\pm$ 1.2, $P = .02$) were significantly higher in the PACU for group IA. However, neither the mean pain scores over the first day after surgery (IS: 5 $\pm$ 2 vs. IA: 5 $\pm$ 3; $P = .4$) nor 24-hour opioid consumption (IS: 4.4 mg $\pm$ 2.8 vs. IA: 4.2 mg $\pm$ 2.6; $P = .4$) were significantly higher in group IA.

Conclusions: PACU measurements of immediate postoperative pain and narcotic consumption favor perioperative interscalene analgesia over intra-articular analgesia. This benefit does not translate into lower overall pain for the first 24 hours after surgery. *Reg Anesth Pain Med 2008;33:134-138.*

Key Words: Shoulder surgery, Intra-articular, Local anesthetic, Interscalene, Pain.

Excellent postoperative pain control plays a key role in the outcome of orthopedic surgery, permitting early rehabilitation and accelerating functional recuperation.[1] Pain control after shoulder surgery remains an important problem. Pain is reported as moderate to severe by up to 70% of patients,[2] prompting a search for techniques that will improve postoperative shoulder analgesia. Of the different postoperative analgesic techniques reported to date in the literature, interscalene brachial plexus block and intra-articular injection of local anesthetics appear superior to surgical wound infiltration,[3] suprascapular nerve block,[4,5] and patient-controlled intravenous opioid analgesia.[4]

Single shot interscalene block provides better pain control and fewer side effects than narcotic analgesia in the first day following surgery.[4,6] However, 20% of patients develop severe pain when the block wears off.[7] Therefore, installation of an interscalene catheter providing continuous blockade is considered the gold standard postoperative pain control technique by many authors,[6,8] despite the additional technical and logistical challenges presented by catheter installation and use, especially in an outpatient setting.

Intra-articular local anesthetic infiltration has the potential advantages of better preservation of motor function and technical simplicity, while providing superior analgesia. A retrospective study of intra-

From the Departments of Anesthesiology (V.B., S.R.W., M.-A.P.) and Surgery (P.T.), University of Montreal, Centre Hospitalier de l'Université de Montréal, Montréal, Quebec, Canada.

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Reprint requests: Stephan R. Williams, M.D., Ph.D., Department of Anesthesiology, CHUM-Hôpital Notre-Dame, 1560 Sherbrooke Street East, Montréal, Quebec H2L 4M1, Canada. E-mail: stephan.williams@umontreal.ca

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articular perfusion of local anesthetics demonstrated good pain relief after arthroscopic surgery for adhesive capsulitis; the absence of motor block with this technique also made active motion of the operated limb possible.[9] In a prospective, double-blind and randomized study, intra-articular local anesthetics delivered via a catheter were found to provide pain relief superior to intra-articular morphine after shoulder arthroscopy, without significantly lowering narcotic consumption.[10] Repeated boluses or continuous infusion may be necessary in order to obtain optimal benefit from intra-articular local anesthetics; single shot interscalene blocks provide better pain relief than single shot intra-articular infiltration.[4]

If a benefit from interscalene or intra-articular block greater than that of a single shot technique is to be achieved without the logistical constraints inherent to sending patients home with a catheter infusing local anesthetics, one alternative is temporary perioperative catheter installation when performing the surgical block. Through this catheter, a bolus of long-acting local anesthetic can safely be administered after the surgery, thereby maximizing block duration while allowing catheter removal before patients are discharged from the recovery room. The present study was therefore designed to compare an intra-articular with an interscalene perioperative analgesic strategy for postoperative analgesia. Both techniques combined a pre-emptive dose of local anesthetic with a catheter allowing reinjection in the recovery room after surgery. We hypothesized that even with reinjection in the immediate postoperative period for both groups, the interscalene strategy would provide superior postoperative analgesia over the first 24 hours after surgery.

Methods

Following ethics committee approval and informed consent, 60 patients scheduled for shoulder surgery were randomly sorted into 2 groups: Group IS received interscalene analgesia and Group IA received intra-articular analgesia. Exclusion criteria were as follows: age <18 years, American Society of Anesthesiologists (ASA) classification >3, severe pulmonary pathology, allergy to local anesthetics, coagulopathy, chronic use of narcotics, and the necessity for an intra-articular drain after surgery.

Every patient enrolled in the study was monitored according to ASA standards, and all surgeries were performed under general anesthesia. Induction consisted of midazolam 1 to 5 mg, remifentanil 0.5 to 4 μg/kg, propofol 1 to 2 mg/kg, and a neuromuscular blocking agent according to the attending anesthesiologists' preference, after which an endotracheal tube was put into place. Anesthesia was maintained with sevoflurane or desflurane at 0.6 to 1.0 minimum alveolar concentration and a remifentanil perfusion titrated from 0 to 0.5 μg/kg per minute to keep hemodynamic values at $\pm$20% of the patient's preoperative values.

Patients in group IS received interscalene block with catheter insertion immediately before induction of general anesthesia. Intravenous midazolam 1 to 5 mg was titrated for patient comfort. The brachial plexus in the interscalene space was located with a 13 MHz 30 mm linear echographic probe (Aloka, Tokyo, Japan). Using an out of plane insertion technique, a 38 mm 18 gauge insulated Tuohy needle (B. Braun Medical Inc., Bethlehem, PA) was positioned using echographic guidance between the anterior and middle scalene muscles. The correct position of the needle was confirmed by a contraction of the pectoral, the deltoid, or the biceps muscle using neurostimulation with a current of 0.3 to 0.6 mA and 0.1 second pulse duration. Lidocaine 2% with epinephrine 2.5 μg/mL (0.25 mL/kg or 5 mg/kg of lidocaine) was then injected, after which a 20 gauge catheter (Contiplex, B. Braun) was inserted 0.5 to 2 cm deep relative to the tip of the needle. The catheter was then fixed with a cutaneous suture (Softsilk, Syneture, Norwalk, CT) and occlusive dressing (Tegaderm, 3M, St. Paul, MN).

In group IA, the orthopedic surgeon sterilely injected 0.25 mL/kg of lidocaine 2% with epinephrine 2.5 μg/mL into the glenohumeral joint immediately after the induction of general anesthesia. The anesthetic was left in the articulation for at least 5 minutes before commencing surgery. At the end of the surgery, a 20 gauge catheter (Contiplex, B. Braun) was installed by the surgeon in the glenohumeral articulation under arthroscopic visualization.

In both groups, immediately before awakening the patient, a second dose of 0.25 mL/kg of 2% lidocaine with epinephrine was injected through the catheter. In the postanesthesia care unit (PACU), patients' static pain was appraised using a numeric rating pain scale (NRPS) of 0 to 10 (0, no pain; 10, worst imaginable pain); if the score was more than 4/10, hydromorphone 0.5 mg was given intravenously every 5 minutes until NRPS was under 4/10 or the patient declined further analgesia. NRPS upon PACU arrival and departure, as well as total PACU hydromorphone consumption was noted. One hour after the second dose of lidocaine, 0.25 mL/kg of bupivacaine 0.25% (0.625 mg/kg of bupivacaine) with epinephrine 2.5 μg/mL was injected via the catheter. Catheters were removed